U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Emballonura semicaudata rotensis*

COMMON NAME: Pacific sheath-tailed bat, Guam and Commonwealth of the Northern Mariana Islands subspecies

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: March 2010

STATUS/ACTION

___ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status
___ New candidate
_X__ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: March 4, 1986, and May 11, 2004
X 90-day positive - FR date: January 21, 1987
X 12-month warranted but precluded - FR date: May 11, 2005
N Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? Yes
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.
Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (*http://endangered.fws.gov/*) provides information on listing actions taken during the last 12 months.

_N_ Listing priority change
Former LP: ___
New LP: ___
Date when the species first became a Candidate (as currently defined): November 15, 1994

___ Candidate removal: Former LPN: ___
___ A – Taxon is more abundant or widespread than previously believed or not subject to

the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Mammal: Family Emballonuridae (Sac-winged, Ghost, and Sheath-tailed bats)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Mariana Islands (Guam and the Commonwealth of the Northern Mariana Islands (CNMI))

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: This subspecies currently occurs only on Aguiguan Island, CNMI.

LAND OWNERSHIP: The entire island of Aguiguan is public land owned by the government of the CNMI.

LEAD REGION CONTACT: Linda Belluomini, (503) 231-6283, linda_belluomini@fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, (808) 792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION

Species Description

This small bat (forearm length c. 1.8 inches (45 millimeters), weight (.19 ounces) (5.5 grams)) is a member of the Emballonuridae, an Old World bat family that has an extensive distribution primarily in the tropics (Nowak 1994). The Pacific sheath-tailed bat was once common and widespread in Polynesia and Micronesia and is the only insectivorous bat recorded from a large part of this area (Hutson *et al*. 2001). The species as a whole (*Emballonura semicaudata*) occurred on several of the Caroline Islands (Palau, Chuuk, and Pohnpei), Samoa (Independent and American), the Mariana Islands (Guam and the CNMI), Tonga, Fiji, and Vanuatu (Flannery 1995; Koopman 1997; Helgen and Flannery 2002). While populations appear to be healthy in some locations, mainly in the Caroline Islands, they have declined drastically in other areas, including Independent and American Samoa, the Mariana Islands, and Fiji (Bruner and Pratt 1979; Grant *et al*. 1994; Wiles *et al*. 1997; Wiles and Worthington 2002). Sheath-tailed bats are rich brown to dark brown above and paler below (Walker and Paradiso 1983). The common name "sheath-tailed bat" refers to the nature of the tail attachment; the tail pierces the tail membrane and its tip appears completely free on the upper surface of the membrane (Walker and

Paradiso 1983). The biology of this species, including reproduction, habitat use, and diet, has been largely unknown (Hutson *et al*. 2001; Wiles and Worthington 2002; Esselstyn *et al*. 2004). Thanks to a recent study, however, we now have more life history information (O'Shea and Valdez 2009, p. 3). Fecal pellets collected from two caves on Aguiguan show a diverse array of prey items, but mostly consisting of small-sized prey, with hymenopterans (ants, wasps, and bees), lepidopterans (moths), and coleopterans (beetles) being the three major food items in the diet of bats from both roosts (O'Shea and Valdez 2009, p. 4). Analysis of presence absence of foraging bats from echolocation stations deployed across Aguiguan indicate that peak activity and occurrence is related to canopy cover, vegetation structure, and distance to know roosts, and native limestone forest is preferred foraging habitat (O'Shea and Valdez 2009, p. 4). Six of eight female bats (12 adults were caught) captured in June and July of 2008 were either pregnant or lactating and 11 pups were observed in roosts in caves (O'Shea and Valdez 2009, p. 5).

Taxonomy

The classification of this species has received varied treatment, but the most thorough and recent taxonomic evaluation for this species has been conducted by K. Koopman (Koopman 1997; Wiles and Worthington 2002). Koopman (1997) recognizes four subspecies: *E. s. rotensis*, endemic to the Mariana Islands; *E. s. sulcata*, occurring in Chuuk and Pohnpei; *E. s. palauensis*, from Palau; and *E. s. semicaudata*, occurring in American and Independent Samoa, Tonga, Fiji, and Vanuatu. This species assessment form addresses the subspecies endemic to the Mariana Islands. After review of the available taxonomic information, we conclude that *E. s. rotensis* is a valid subspecies. Analysis of wing biopsy samples collected in 2008 might help ascertain if the subspecies designation is appropriate (O'Shea and Valdez 2009, p. 94).

Habitat/Life History

The Pacific sheath-tailed bat is a small bat that appears to be cave-dependent, roosting during the day in a wide range of caves, including overhanging cliffs, crevices, and lava tubes (Grant 1993; Grant *et al*. 1994; Hutson *et al*. 2001). Bats and cave swiftlets (*Aerodramus* spp.) may be found sharing caves (Lemke 1986; Hutson *et al*. 2001; Tarburton 2002; Wiles and Worthington 2002). The population on Aguiguan appears to prefer relatively large caves (Guam Division of Aquatic and Wildlife Resources (GDAWR) 1995). Large roosting colonies appear to be common for the Palau subspecies, but smaller aggregations may be more typical of at least the Mariana Island subspecies and perhaps other *Emballonura* (Nowak 1994; Flannery 1995; Wiles *et al*. 1997; Wiles and Worthington 2002). The Pacific sheath-tailed bat is nocturnal and typically emerges around dusk to forage on insects (Hutson *et al*. 2001). In 1995, roosting bats on Aguiguan were detected in 5 of 77 caves surveyed (G. Wiles, pers. comm. 2007), with colony sizes ranging from 2 to 64 individuals. Observations at that time indicated that the bats preferred large caves, as nearly all of the caves used for roosting were characterized as "large" by the researchers (Wiles and Worthington 2002). Recent work supports that this bat prefers larger caves (O'Shea and Valdez 2009, p. 4).

A survey of habitat use by Pacific sheath-tailed bats on Aguiguan in 2003 revealed that bats foraged almost entirely in forests (native and non-native) near their roosting caves and clearly did not utilize the non-forested habitats on the island (Esselstyn *et al*. 2004). Bruner and Pratt (1979) also observed sheath-tailed bats foraging in native forests on Pohnpei.

Historical Range/Distribution

E. s. rotensis is known historically from the Mariana Islands and formerly occurred on Guam and in the CNMI on Rota, Aguiguan, Tinian (known from prehistoric records only), Saipan, and possibly Anatahan and Maug (Lemke 1986; Steadman 1999; Wiles and Worthington 2002).

Current Range/Distribution

E. s. rotensis appears to be extirpated from all but one island in the Mariana archipelago (Hutson *et al*. 2001; Wiles and Worthington 2002). The single remaining population of this subspecies occurs on Aguiguan, CNMI. Aguiguan is currently uninhabited and is the smallest of the southern islands of the CNMI, only 3 miles (mi) (5 kilometers (km)) long, .9 mi (1.5 km) wide, and 1,730 acres (7 square kilometers) in area (Engbring *et al*. 1986).

Population Estimates/Status

The sheath-tailed bat population on Aguiguan has not been adequately monitored to date due to the relative inaccessibility of the island. It is an uninhabited island, only accessible by helicopter or boat, and boat access is treacherous because there are no safe landings. Surveys in 1995 indicated a population of roughly 150 to 250 animals (Wiles and Worthington 2002), while 2003 surveys indicated a population of about 400 to 500 animals but it was unclear if this difference reflected a population increase (G. Wiles, pers. comm. 2007). In 2008, a biological assessment for the sheath-tailed bat was carried out on Aguiguan by a team consisting of a former GDAWR bat biologist, and four bat biologists from the United States Geological Survey (USGS) Fort Collins Science Center and the USGS Pacific Islands Research Center. The assessment consisted of determining present abundance and use of caves on Aguiguan and interpreting the data in comparison to a synthesis of literature and past unpublished data; establishing baseline site occupancy models of spatial foraging habitat use via monitoring of ultrasonic echolocation calls; determining basic aspects of diet through an analysis of fecal material; sampling captured bats to obtain new data on reproduction and body size, as well as collecting samples for future genetic analysis; and determining characteristics of cave temperature and humidity (O'Shea and Valdez 2009, p. 3). A review of specimens available in research museums was also conducted, and samples obtained from guano deposits that may be useful in analysis for contaminants in comparison with analysis of guano from other islands where these bats have become extinct. A limited survey for the presence of these bats on Tinian was also conducted. The assessment report summarizes previously unpublished results on numbers of Pacific sheath-tailed bats roosting in caves on Aguiguan in 1995 and 2003, and compares past results with findings from new surveys conducted in 2008 (O'Shea and Valdez 2009, p. 3). The results of this assessment indicate a small population of sheath-tailed bat persists on Aguiguan, with a range of 359-466 individuals counted at five of 41 caves (O'Shea and Valdez 2009, p. 3). Comparison with past counts suggests that the population has increased over the past 13 years (O'Shea and Valdez 2009, p. 3).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. The forested habitats needed for foraging by the Pacific sheath-tailed bat on Aguiguan were reduced in the past for agricultural purposes and are currently being degraded by the activities of feral goats (*Capra hircus*) on the island (Engbring *et al*. 1986; Wiles and Worthington 2002;

Esselstyn *et al*. 2004). The native forests on the plateaus of the island of Aguiguan were cleared in the 1930s for agriculture by the Japanese and the abandoned fields are overgrown with weeds (Engbring *et al*. 1986). A large number of feral goats inhabit the island; in fact, the local name for the island is "Goat Island." Continued grazing by feral goats poses a serious threat to the foraging habitat of the Pacific sheath-tailed bat (Wiles and Worthington 2002; Esselstyn *et al*. 2004). Feral goats eat native vegetation, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. They are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980; van Riper and van Riper 1982; Scott *et al*. 1986; Tomich 1986; Culliney 1988; Cuddihy and Stone 1990). Goats on Aguiguan have already limited the regeneration of most tree species on the island, and, over time, could conceivably lead to the complete elimination of forest on the island (Esselstyn *et al*. 2004). Non-forest habitats that are created as a result of goat browsing and trampling are clearly not utilized by the sheath-tailed bat on Aguiguan (Esselstyn *et al*. 2004). The CNMI Division of Fish and Wildlife (DFW) considers habitat loss due to feral goat grazing to be the biggest threat to the bat on Aguiguan (L. Williams, DFW, pers. comm. 2005).

B. Overutilization for commercial, recreational, scientific, or educational purposes.
None known.

C. Disease or predation.
On Guam, the brown treesnake (*Boiga irregularis*) was accidentally introduced after World War II and has caused the decline, extirpation, and extinction of most of the native birds as well as having been involved in significant declines of the Mariana fruit bat (*Pteropus mariannus mariannus*) and various species of native lizards and invertebrates (Wiles 1987; Rodda and Fritts 1992; Wiles *et al*. 1995; Wiles *et al*. 2003). There is no evidence linking the brown treesnake to the loss of the Pacific sheath-tailed bat on Guam; however, it is possible that it may have played some role in the species' extirpation (G. Wiles, pers. comm. 2007). Recently, experts agreed that the brown treesnake may be establishing a population on Saipan, though clear evidence of establishment or recruitment is lacking (Colvin *et al*. 2005; Rodda and Savidge 2007, p. 312) and a few brown treesnakes have been observed on Tinian, although it is not thought to be established there. There is potential for the spread of the brown treesnake to other islands in the CNMI from Guam or Saipan. This potential may be lower for Aguiguan because of the relatively low rate of human traffic to this island, but it is still a possibility.

Introduced monitor lizards (*Varanus indicus*) and rats (*Rattus* spp.) also are potential predators of sheath-tailed bats on Aguiguan, but this has not been studied (Wiles and Worthington 2002). Likewise, the role of disease in the species' decline is not known, as it has not been studied; however, disease could be a factor, especially for a communally cave roosting species such as the Pacific sheath-tailed bat (Wiles and Worthington 2002). In the northeastern United States, bat declines exceeding 75 percent have recently been observed at bat hibernacula due to white-nose syndrome, often characterized by a striking white fungal growth on the muzzles, ears, and /or wing membranes of affected bats (Blehert *et al*. 2009, p. 227). The first evidence of this threat to cave roosting bats was documented in 2006. Although currently confined to the northeastern United States, if this condition spread to the Mariana Islands, it could result in the extirpation of the subspecies.

D. The inadequacy of existing regulatory mechanisms.
Currently, no formal or informal protection is afforded to the Pacific sheath-tailed bat by Federal agencies or by private individuals or groups. The Government of Guam listed the species in 1982 as endangered (5 Guam Code Annotated, Section 63205(c), The Endangered Species Act of Guam) although it is apparently extirpated from Guam (Lemke 1986). The Pacific sheath-tailed bat was placed on the CNMI Endangered Species List in 1991 when the List was created pursuant to Public Law 2-51, 2 CMC 5108; however, the law offers no regulatory protections (Wiles and Worthington 2002).

Feral goats are considered a game animal and are hunted as a resource in the CNMI. The goats on Aguiguan are regulated by the Tinian municipality, which regulates the animals in a manner that maintains the goats at a sufficiently high number for ease of hunting (L. Williams, pers. comm. 2005).

E. Other natural or manmade factors affecting its continued existence.
The low numbers of individuals of this subspecies and the fact that only one population remains in the Mariana Islands places it at great risk of extinction from inbreeding and stochastic events such as storms (Wiles and Worthington 2002). This threat is particularly significant in cave dwelling species whose population is often highly localized (Wiles and Worthington 2002). Because there are relatively few (300 to 500) animals in only one location, a severe storm, a disease outbreak, inbreeding depression, or even a disturbance to the roost caves could lead to the extirpation of this subspecies.

Many caves in the Mariana Islands were heavily affected by human occupation and warfare during World War II, during which time they were sometimes bombed or used as fortifications or for human habitation (Hutson *et al*. 2001; Wiles and Worthington 2002). After the war (and likely before) caves were often used by hunters, vandals, hikers, and guano miners (USFWS 1992; Hutson *et al*. 2001; Helgen and Flannery 2002; Wiles and Worthington 2002). It would be difficult to quantify such an impact and to date no such efforts have been undertaken, but Pacific sheath-tailed bats are thought to be very sensitive to disturbance in their caves (Grant 1993). According to Wiles and Worthington (2002), sheath-tailed bats are typically alert at day roosts and will fly to alternate roosts if disturbed. Hutson *et al*. (2001) also suggest that disturbances to caves and burning of forests have contributed to the decline of the subspecies of Pacific sheath-tailed bat found in Fiji.

Current pesticide levels do not appear to be a threat in the Mariana Islands. However, further investigation of pesticide levels in guano accumulations should be conducted to study their role in past declines (Grue 1985; Wiles and Worthington 2002). Pesticides may have caused a reduction in insect prey base availability as well as poisoning of bats (Wiles and Worthington 2002). Pesticide application was probably most intense on Guam, Saipan, and Tinian because of their larger human populations and the presence of American military bases. Since Aguiguan was neither populated nor used agriculturally after World War II, it is unlikely that pesticides were applied there, perhaps contributing to the persistence of bats on the island (Wiles and Worthington 2002).

It is not believed that intentional take is a threat to the Pacific sheath-tailed bat, but they may be threatened by human recreational use of caves (Wiles and Worthington 2002). Roost disturbance is a well known problem for many cave-dwelling species (Palmeirim *et al*. 2005). Disturbance at caves may cause bats to leave for alternate roost sites, in turn, increasing their risk of predation and decreasing their roost time, the latter which could increase stress.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED:
No conservation measures have been planned or implemented for the Pacific sheath-tailed bat in the Mariana Islands. The CNMI DFW periodically monitors the status of the remaining population of the Pacific sheath-tailed bat (the most recent DFW surveys on Aguiguan were in 1995 and 2003). However, the island is difficult to access and there is no management plan or standardized monitoring program currently in effect. The 2008 assessment report lays out considerations for future monitoring, research, and conservation which will be helpful in developing a plan or program (O'Shea and Valdez 2009, p. 7).

SUMMARY OF THREATS:
This subspecies has been extirpated from at least four (Guam, Rota, Tinian, Saipan), and possibly six (including Anatahan and Maug), islands of the Mariana archipelago and the remaining isolated population occurs on only one small island. Current threats to this subspecies include habitat loss and degradation, predation by introduced species, vulnerability due to small population size and significantly reduced distribution, and possible disturbance to roosting caves (Grant *et al*. 1994; Hutson *et al*. 2001; Wiles and Worthington 2002; Esselstyn *et a*l. 2004). We find that this subspecies is warranted for listing throughout all of its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:
___Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES:

- Repeat surveys and monitoring for sheath-tailed bats on Aguiguan every 2 years.
- Conduct genetic analyses to determine if this subspecies warrants species status.
- Remove feral goats from Aguiguan.
- Restore native forest on Aguiguan.
- Develop a reintroduction plan for reestablishment of populations on other Mariana islands.
- Prevent introduction of brown treesnake to Aguiguan.
- Control mammalian predators on Aguiguan.
- Determine effects of predation by monitor lizards and implement control measures, as necessary, on Aguiguan.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	2
		Subspecies/population	**3***
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:
The magnitude of threats to this species is high. The entire remaining population of this species is highly threatened by its small size and extremely restricted distribution, which makes it susceptible to stochastic natural disturbances, such as typhoons and disease outbreaks, and by loss of foraging habitat as a result of continued browsing and trampling by feral goats. Other, potential threats include predation by introduced predators and human disturbance of roosting caves. The disappearance of the Aguiguan population of the Pacific sheath-tailed bat would result in the extinction of a subspecies endemic to the Mariana Islands.

Imminence:
Threats to the Pacific sheath-tailed bat are imminent because they are ongoing.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted?
No. The subspecies does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the timeframe of the routine listing process. The biggest threat at this time to the last population on Aguiguan appears to be the vulnerability to stochastic events, such as typhoons, which cannot be addressed through the protections of listing the subspecies. If it becomes apparent that the routine listing process is insufficient to prevent significant losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of the Pacific sheath-tailed bat in the Mariana

Islands as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING:

The CNMI Division of Fish and Wildlife (DFW) is responsible for monitoring *E. s. rotensis*. This agency is funded through the U.S. Fish and Wildlife Service's (Service) Federal Assistance program for wildlife restoration on an annual basis to monitor and manage the fish and wildlife resources of the CNMI, and the Service requests annual updates from DFW on the status of candidate species. We also reviewed current scientific literature to seek new published information about the species, and we sent our most current information to regional and species experts for review. Although no regular surveys are conducted for the Pacific sheath-tailed bat in the CNMI, efforts are made to monitor the species. The most recent thorough surveys on Aguiguan were conducted in 2008. Before that, Pacific sheath-tailed bat surveys on Aguiguan have been conducted sporadically from 1986 to 2003 by DFW (Lemke 1986; Rice and Taisacan 1993; Wiles and Worthington 2002; Esselstyn *et al*. 2004). In 2003, researchers made an 11-day survey trip to the island during which searches were made of known and potential roost caves, emergence counts were made at those caves, and stations counts were made systematically using bat detectors for the first time. In 2003, one new roost cave was discovered (G. Wiles and J. Esselstyn, unpubl. data *in* Esselstyn *et al*. 2004). The surveys conducted in 2008 have yielded new information on status, habitat use, feeding, reproduction, and monitoring (O'Shea and Valdez 2009, pp. 3-7).

This species is classified as endangered in the International Union for Conservation of Nature and Natural Resources (IUCN) Red Data List database (IUCN 2006); a species of greatest conservation need in the Guam Comprehensive Wildlife Conservation Strategy (GDAWR 2005); and a species in need of conservation in the CNM Is' 2005 Comprehensive Wildlife Conservation Strategy (Berger *et al*. 2005).

COORDINATION WITH STATES

The latest assessment form was sent to GDAWR and CNMI DFW on January 29, 2010, with a request for updated information on the taxon, if available. No response was received.

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:

Acting Carolyn A. Bohan 5/18/10
Regional Director, Region 1, Fish and Wildlife Service Date

Lowell W Hovell
ACTING
Director, Fish and Wildlife Service October 22, 2010

Concur:

Do not concur: _____
Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: March 26, 2010
Conducted by: Lorena Wada, Pacific Islands FWO
Biologist, Prelisting and Listing Program

Comments:
PIFWO Review

Reviewed by: Christa Russell Date: April 5, 2010
Prelisting and Listing Program Coordinator

Marilet Zablan Date: April 26, 2010
Assistant Field Supervisor, Endangered Species Division

Gina Shultz Date: April 30, 2010
Acting Field Supervisor